

Course Overview

Fundamental principles of electrodynamics, including electrostatics, magnetostatics, electric potential, electric and magnetic fields in matter, simple behavior of time-dependent electric and magnetic fields, and Maxwell's equations.

Prerequisites: PHYS 1304, MATH 3302, MATH 3313. PHYS 4321 recommended.

This is a flipped active-learning class in which students can expect to do preparatory work before class and then work in small groups during class.

Instructor Biography

Prof. Dalley is a theoretical physicist who has worked in Oxford, Cambridge, Princeton and CERN. He has been teaching physics courses at SMU, from non-science majors to graduate students, since 2006. In 2013, Prof. Dalley received both an Outstanding Professor Rotunda Award and the Provost's Teaching Recognition Award. At SMU he also directs science outreach programs and professional development courses for high-school physics teachers.

Course Learning Outcomes: The student should be able to

- Calculate the electrostatic potential from a knowledge of the electrostatic electric field, by using the multipole expansion in tandem with a knowledge of the charge distribution, using the method of images, or the separation of variables technique to solve Laplace's equations.
- Understand the electrostatic properties of conductors and dielectrics, calculate static electric field with the differential and integral forms of Gauss' law and bound charge distributions in dielectrics.
- Calculate the static magnetic field in vacuum and in magnetic materials for a given time-independent current density
- Calculate time dependent behavior of electric and magnetic fields in vacuum using Maxwell's equations

Class Meeting: Tu/Th 2:00 p.m. – 3:20 p.m. FOSC 155

Instructor: S. Dalley, Room 207 Fondren Science, sdalley@smu.edu

Office Hours: Tu/Th 10:00 – 11:00 am and 4-5 pm or by appointment

Text: "Introduction to Electrodynamics" 4th edition by David. J. Griffiths, (Pearson) ISBN 978-0-321-85656-2. Other editions OK if you make the translation.

Website: <http://www.physics.smu.edu/sdalley/4392/S19.htm>

- I will use your official SMU e-mail address to communicate with you – please check it!
- Academic Dishonesty will result in a course F grade and filing with the Dean of Student Life.
- During class, phones should be put away except when needed for course-related tasks.

	TOPIC	Pre-Class Prep	HW due
1/22/2019	Introduction & Vector Algebra	Read 1.1	
1/24/2019	Vector Calculus	Read 1.2-3 Do 1.20	
1/29/2019	Curvilinear Coords, Dirac Delta, Field Theorems	Read 1.4-6 Do Warmup 1	1.7, 1.25, 1.33
1/31/2019	Electrostatic Field & Gauss' Law	Read 2.1-2 Do Warmup 2	
2/5/2019	Electrostatic Potential & Energy	Read 2.3-4 Do Warmup 3	1.43, 2.6, 2.16
2/7/2019	Conductors	Read 2.5 Do Warmup 4	
2/12/2019	<i>Review of 1.1 – 2.5</i>		2.27, 2.38, 2.43
2/14/2019	<i>Test 1</i>	1.1 – 2.5	
2/19/2019	Laplace's Equation & Method of Images	Read 3.1-3.2 Do 3.7	
2/21/2019	Separation of Variables	Read 3.3 Do Warmup 5	
2/26/2019	Electrostatic Multipole Expansion	Read 3.4 Do Warmup 6	3.9, 3.13, 3.19
2/28/2019	Electric Polarization	Read 4.1-2 Do Warmup 7	
3/5/2019	Electric Displacement and Linear Dielectrics	Read 4.3 – 4.4.1 Do Warmup 8	3.28, 3.31, 4.11
3/7/2019	Boundaries and Energy in Dielectrics	Read 4.4.2 – 4.4.4. Do Warmup 9	
	<i>SPRING BREAK</i>		
3/19/2019	<i>Review of 3.1 - 4.4</i>		4.18, 4.21, 4.26
3/21/2019	<i>Test 2</i>	3.1 - 4.4	
3/26/2019	Lorentz Force & Current Density	Read 5.1 Do 5.3	
3/28/2019	Biot-Savart Law & Div/Curl of B	Read 5.2 - 5.3.2 Warmup 10	
4/2/2019	Ampere's Law & Maxwell's Static Equations	Read 5.3.3 – 5.3.4 Do Warmup 11	5.5, 5.10, 5.11
4/4/2019	Magnetic Vector Potential	Read 5.4 Do Warmup 12	
4/9/2019	Magnetization	Read 6.1 – 6.2 Do Warmup 13	5.15, 5.21, 5.35
4/11/2019	H Field	Read 6.3-6.4 Do 6.14	
4/16/2019	<i>Review of 5.1 – 6.4</i>	Practice Test 3	6.3, 6.8, 6.16
4/18/2019	<i>Test 3</i>	5.1 – 6.4	
4/23/2019	Electromotive Force	Read 7.1 Do Warmup 14	
4/25/2019	Magnetic Induction	Read 7.2 Do Warmup 15	
4/30/2019	Maxwell's Equations	Read 7.3 Do 7.36	7.8, 7.16, 7.22
5/2/2019	<i>Review of 7.1 – 7.3</i>		
5/14/2019	<i>Final Exam 11:30-2:30</i>	Chaps 1 – 7	

Assessment

WARMUP (10%)

Before each class you are expected to read relevant sections of the textbook and attempt the suggested problem from Griffiths or Warmup sheet. You are required to submit your attempt at the start of class.

PARTICIPATION (10%)

In class, you are expected to meaningfully work and discuss with other students in a small group to solve problems and answer questions. This is not just an attendance grade and is at the discretion of the instructor.

HOMEWORKS (25%)

Post-class homework assignments are due most weeks and must be turned in at the beginning of class on the due date to gain credit. Assignments are linked on the course website and due dates shown on the syllabus. Late homeworks are counted at 50% and the lowest homework will be dropped.

IN-CLASS TESTS (7% each)

There will be three 75-min in-class tests on the most recent topics. You may use a calculator and the course textbook during the tests.

TEST REDOs (3% each)

You have the opportunity to correct your graded Tests in your own time. Redos must be submitted within one week of receiving your graded Test back. If no Redo is submitted, the original Test score will count for the Redo credit.

FINAL EXAM (25%)

There will be a 3 hr comprehensive final exam. You may use a calculator and the course textbook during the exam.

Course Grade

Grade Boundaries are roughly defined as

A > 90% > A - > 85% > B+ > 80% > B > 75% > B- > 70% > C+ > 65% > C > 60% > D > 50% > F

Disability Accommodations: Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/ALEC/DASS> to begin the process. Once registered, students should then schedule an appointment with the professor as early in the semester as possible, present a DASS Accommodation Letter, and make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities: Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)

Attendance: If you are absent from class without valid reason for two consecutive weeks you will be administratively dropped from the course.